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# Changes in dental attitude and behavior among Dutch adults wearing complete dentures

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**Abstract** – In 1992 a follow-up on the Dutch National Dental Survey of 1986 (DNDS) was performed. The main objective was to detect and analyze changes in oral self care, dental attendance, and oral health status. This paper will focus on the DNDS adults wearing complete dentures. Changes over a 6-yr period will be presented of: dental attendance, denture satisfaction and wearing of the complete dentures, and denture treatments. A postal questionnaire was used: 232 persons (64%) participated in the study. Analysis of Variance (ANOVA) was used to study the effect of dental and social variables on observed changes since 1986. Risk ratios (RR) were computed to clarify the actual effects of these variables. With respect to dental attendance, a shift towards visits for denture check-ups was found, thought to reflect the respondents' concern for their complete dentures (RR=1.6). A small shift towards more visits because of denture problems was found. This was attributed to denture treatments that had taken place between 1986 and 1992 (RR=2.8). With respect to changes in denture satisfaction, no influence of denture treatments could be noted, but a relation was found with a variable indicating the imperfection of the complete dentures as felt by the respondents (RR=2.8). In 31% of the respondents some denture treatment had been performed since 1986. No objective dental criteria of complete dentures and denture bearing areas had influenced these denture treatment decisions, but only respondents' subjective criteria (RR=1.9-2.9).

**Key words:** edentulous; epidemiology; longitudinal

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According to future-scenarios on dental health care (1), in the Netherlands the next 25 yr will be characterized by a decrease in the absolute and relative numbers of edentulous Dutch adults. In the period 1988-90, 24% of the Dutch population 16 yr of age and older was edentulous; it is expected that in the year 2020 about 1.7 million persons (ca. 12%) of the Dutch adult population will be edentulous (1, 2). However, it is expected that in future these edentulous older adults will use dental services more frequently than they used to: an increased dental awareness is thought to likely prompt these persons to visit the dental

profession in the case of dissatisfaction with complete dentures (3). Thus, despite declining figures of edentulousness, it would remain an important phenomenon in the Dutch dental future.

In 1986 the first nationwide dental survey among the adult population in the Netherlands (DNDS) was carried out (4, 5). The aim of the study was to obtain representative baseline data of the Dutch population, 15-74 yr of age, with respect to the prevalence of oral disorders, objective and subjective treatment needs, and oral self care (6-14). Using nonproportional stratified cluster sampling, a sample of 6577 persons was

contacted, of whom 3526 persons were subsequently interviewed and participated in a clinical dental examination. Stratification factors were age, sex, socioeconomic status (SES), and region of living; the degree of urbanization was proportionally represented in each region. Representative figures were obtained by weighting (4, 5). With respect to persons wearing complete dentures (14), it was found that a minority visited a dentist: 8% dental attendance for denture check-ups, and 22% for visits because of denture problems. On average, the complete dentures were 12 yr old, about 20% being older than 20 yr. With



respect to objective criteria of the complete dentures as measured at the DNDS clinical examination (15), 8–14% of the complete dentures was found to comply with the formulated quality aspects. In 60% at least half of these aspects was found to be correct. Up to 21% of the maxillary alveolar ridge was found to be severely resorbed, whereas in the mandible it was 75%.

In 1992 a follow-up on the DNDS was performed. The main objective of the follow-up study was to detect and analyze changes over the period 1986–1992 on the aspects as obtained with the DNDS. This paper focuses on Dutch adults wearing complete dentures. The aim of our study was to detect and analyze over the 6-yr period changes in dental attendance, denture satisfaction and wearing of complete dentures, and denture treatments.

## Methods

For the present study the Dutch adults wearing complete dentures who participated in the 1986 DNDS-interview and the clinical dental examination were selected: after excluding the persons who were known to have died, a total of 446 persons was eligible for the follow-up on the DNDS. Contrary to 1986 when the participants were interviewed during a home visit, a postal questionnaire was used to obtain information concerning dental attendance, denture satisfaction, wearing of complete dentures, treatment needs, and denture treatments. The same line of questioning on these issues was used as in the 1986 interview (4).

A total of 315 questionnaires was returned in stamped addressed envelopes, 68 of those having been returned undelivered because of a change in address, and 15 because of death of the addressed person. Thus, of a total of 232 (64% of possible participants) Dutch adults wearing complete dentures, follow-up data of dental and social variables were available over a 6-yr period. In Table 1 the composition of the group of respondents to the DNDS and to the follow-up study on the DNDS, and the percentual response of respondents to the follow-up study relative to the DNDS, are listed by stratification factors. In order to check whether the response had resulted in a selectivity on relevant variables, Analysis of Variance (ANOVA; enter level 0.05)

was used. No statistically significant differences were found.

The group of respondents whose complete dentures had been replaced since 1986 (54 persons), and whose complete dentures had been rebased/relined since 1986 (17 persons), were for statistical reasons merged into one study group ("Denture treatment"). This was done since the interest of our study was in the treatment needs as felt by the respondents, rather than in the technical decision of the dentist to choose for preparing new dentures or merely altering the existing dentures.

ANOVA (on main effects, and on first order interactions between variables; enter level 0.05) was applied to study the changes in attitude since 1986, i.e. a shift from one answering level (on the attitudinal variables under study) in 1986 to another in 1992, and to study the influence thereon of DNDS-dental and social variables (4, 14). Considered were: changes in dental attendance (visits vs. no visits for denture check-ups previous to the DNDS and between DNDS and follow-up study; visits vs. no visits because of denture problems previous to the DNDS and between DNDS and follow-up study), changes in denture satisfaction (satisfied, dissatisfied, neither satisfied nor dissatisfied with complete denture at DNDS and follow-up) and changes in the wearing of complete dentures (day and night vs. only during daytime), and denture treatments. DNDS-dental and social variables used in the analyses comprised person-variables (e.g. SES, sex, age), clinical variables (e.g. quality of complete dentures, levels of alveolar ridge resorption, denture treatments), social variables (e.g. fear for denture problems, denture satisfaction, dental knowledge) and behavioral variables (e.g. dental attendance, denture satisfaction, wearing of complete dentures). A comprehensive description and definition of DNDS-variables is published previously (4, 14). Only variables that showed statistically significant influences on observed changes since 1986 were addressed. These variables are summarized and explained in Table 2. Risk ratios (RR), or relative risks (16), were computed to clarify the actual effect of the variables with statistically significant influences on the changes. The original multiple answering levels of "Satisfaction with 1986-complete dentures" were re-

grouped into two new levels: "Satisfied" and "Non-satisfied". Analogously, SES-levels "High" and "Middle" were joined.

## Results

In Table 3 the variables that were found to have statistically significant influences on one or more of the observed changes since 1986, are listed by their RR's for the various changes. In the case of a statistically significant influence of a variable on a change, the level of the *P*-value is given, and the 95% confidence interval (CI) of the RR.

*Dental attendance* – With respect to dental visits for denture check-ups a statistically significant shift ( $P \leq 0.001$ ) of 117 respondents, who did not report a visit previous to the DNDS, towards visits between the DNDS and follow-up study, could be noted; only four persons reported a shift from visits towards no visits. As shown in Table 3, three variables showed statistically significant influences on the shift towards dental visits for denture check-ups. "Number of complete dentures": those who had had at least three complete dentures were 1.7 times as likely to have shifted towards denture check-ups than the persons who had worn less complete dentures. When having had denture treatment since 1986, this likelihood was 1.6 times; when having the border extensions of the complete dentures estimated as "correct" during the DNDS-clinical examination, it was 2.0 times.

With respect to dental attendance because of denture problems, a statistically significant shift ( $P = 0.01$ ) of 51 respondents, who did not report of a visit previous to the DNDS, towards dental visits between the DNDS and follow-up study, could be noted; whereas 28 persons had changed to no visits. The mostly reported reasons for these visits were: a lost tooth (30%), a broken denture (18%), lack of retention (18%), and the idea that the dentures were worn (17%). As can be seen from Table 3, two variables had statistically significant influences on the shift towards visits because of denture problems: Denture treatment, and SES-Low. In 1992, 73% of the respondents reported to visit a dentist immediately when having complaints of or problems with their complete dentures; 38 persons reported to have complaints about the complete den-



Table 1. Composition of edentulous respondents to DNDS and to follow-up study by percentages, subdivided on DNDS-stratification factors. Percentual response of follow-up study relative to DNDS, subdivided on DNDS-stratification factors

	SES			Sex		Region				Age		
	High	Middle	Low	Male	Female	North	East	South	West	20-55	55-64	≥65
DNDS composition	18	19	63	47	53	32	25	26	18	32	30	38
Follow-up composition	22	20	58	45	55	30	31	22	17	33	32	35
% response	69	61	53	55	60	55	72	50	53	59	62	53

Table 2. Variables with statistically significant influences on changes in dental attendance, denture satisfaction and wearing of complete dentures, and denture treatment since 1986 in edentulous Dutch adults. Levels of these variables, as used for calculating Relative Risks (RR), showing the significant influence of observed changes. Interpretation and explanation of these variables

Name of variable	Level for RR	Interpretation
SES	Low	Minimum levels of income and education; rating of present profession
Edentulous-period	<20 yr	Being edentulous in both jaws for less than 20 yr
Denture age	-	Average age of complete dentures as present in 1986
Number of complete dentures	≥3	Having worn three or more complete dentures in both jaws, including complete dentures as present in 1986
Denture border	Correct	No under- or overextension of borders of maxillary and mandibular dentures as measured during DNDS-clinical examination
Denture satisfaction	Dissatisfaction	Respondent's statement on DNDS-questionnaire to be non-satisfied with the present complete dentures
"My dentures need to be treated."	Confirmation	Respondent's statement on DNDS-questionnaire to have the opinion that the present complete dentures need to have some treatment
"I fear my dentures may come loose."	Confirmation	Respondent's statement on DNDS-questionnaire to fear that the present complete dentures might come loose during functioning
Denture treatment	Performed	Constructed variable: having new complete dentures since 1986, or rebasing/relining of complete dentures as present in 1986

tures. The main reason for not having visited a dentist, or dental technician, thus far to solve these denture problems, was in 21% of the cases the idea that nothing could be done.

**Denture satisfaction** – With regard to denture satisfaction, 62 persons reported differently than in 1986: 34 persons had shifted from non-satisfaction towards denture satisfaction, whereas 28 persons had shifted from denture satisfaction towards non-satisfaction. The main reason for dissatisfaction with the complete dentures in 1992 was an impaired function (78%). As can be seen from Table 3, one variable showed a statistically significant influence on changes in denture satisfaction: the respondents who in 1986 did consider it necessary to have their complete dentures treated were 2.8 times as likely to show a shift towards denture dissatisfaction than the persons who did not consider it necessary to have their dentures treated. No statistically significant influence of "Denture treatment" was found on changes in denture satisfaction.

**Wearing of complete dentures** – All re-

spondents reported that they were wearing their complete dentures; yet two persons reported doing so only when having visitors. A statistically significant ( $P \leq 0.001$ ) shift from wearing the dentures day and night previous to the DNDS, towards wearing them currently only during day time, could be observed in 38 persons. In Table 3, three variables are shown to have statistically significant influences on this shift: DNDS-stratification factor SES-Low; being less than 20 yr edentulous during the DNDS; and having expressed the opinion during the DNDS that the complete dentures needed treatment.

**Denture treatment** – Seventy-one respondents reported denture treatments since 1986. According to 47% of the respondents the reason for treatment was that the dentures were damaged, and in 42% because there was an impaired function or pain. A number of four variables showed statistically significant influences on having complete denture treatments: "My dentures need to be treated", and "I fear my dentures may come loose". If at least three complete dentures had been

made, the Relative Risk was 2.4 for having complete dentures treated. The persons who were non-satisfied with their complete dentures during the DNDS were 2.6 times as likely to have dentures treated. A statistically significant influence ( $0.01 < P \leq 0.05$ ) of "Denture age" was found: in the persons having had denture treatment the average age of the complete dentures in 1986 was 9.6 yr, whereas it was 12.7 yr in those without denture treatments. The overall average denture age of the group of respondents had increased from 11.9 yr in 1986 to 13.9 yr in 1992 (average denture age of those with new complete dentures since 1986 was set at 3 yr).

## Discussion

Non-response in follow-up studies may result in a selective response-group, being non-representative for the larger study-group on certain variables. However, when considering such a study-group as a cohort, non-response is of minor importance when presenting follow-up data, for the results are compared

Table 3. Variables with statistically significant influences on changes in dental attendance, denture satisfaction, wearing of complete dentures, and denture treatment since 1986, by risk ratios (RR). Levels † of *P*-value (*P*) and 95% confidence interval of RR (CI) are presented when of statistically significant influence on the changes

Variables	Changes in									
	Dental attendance				Denture satisfaction		Wearing complete dentures		Denture treatment	
	Check-ups		Denture problems							
	<i>P</i>	RR	<i>P</i>	RR	<i>P</i>	RR	<i>P</i>	RR	<i>P</i>	RR
SES		1.1	*	0.7		1.2	*	1.3		0.8
CI				0.5–1.0				1.0–1.7		
Edentulous-period		0.8		0.9		0.8	*	1.7		1.0
CI								1.1–2.5		
Number of dentures	***	1.7		1.3		1.6		0.5	**	2.4
CI		1.3–2.2								1.1–5.1
Denture border	*	2.0		1.2		0.7		1.4		1.6
CI		1.1–4.0								
Denture satisfaction		1.1		1.2		–		1.4	**	2.6
CI										1.4–5.0
"My dentures need to be treated"		1.1		1.2	***	2.8	*	1.6	**	1.9
CI						1.7–4.6		1.1–2.3		1.3–2.7
"I fear my dentures may come loose"		1.2		1.5		1.2		0.9	**	2.9
CI										1.6–5.4
Denture treatment	***	1.6	***	2.8		0.8		1.2		–
CI		1.3–1.8		1.6–4.7						

† \*  $0.01 < P \leq 0.05$ .

\*\*  $0.001 < P \leq 0.01$ .

\*\*\*  $P \leq 0.001$ .

within the same group of persons. For the same reasons, selectivity of the respondents is of little importance when searching for explanations for these observed results. Influences of certain variables can be studied and might reveal some statistical significances. As such, in our study changes in dental attendance, denture satisfaction and wearing of complete dentures, and denture treatment were analyzed by stratifying them on variables as obtained during the 1986-clinical examination and questionnaires. Another example can be found in deliberately restricting a study-population on certain variables in order to enhance the internal validity of the study (16). However, for extrapolation of the results from a selective study group to an actual other population (target population), e.g. generalization to national data, representativeness on relevant variables is mandatory since selectivity per se could account for deviations in results of study-group and target-group (17). The composition of our response-group was found to be in accordance with that of the original DNDS-group; no selectivity on relevant variables for the changes under study were found. There-

fore, our results can be considered to reflect actual changes among Dutch adults wearing complete dentures.

A distinction between the 1986 and 1992 questionnaire is present in that the former was an oral one whereas the latter was a written one. Asking for answers in the set-up of an oral interview might give rise to "socially desirable" answers, more than when asking the same questions on the basis of anonymity in a written form, especially when addressing attitudes towards health behavior and received health care (4, 18). A positive aspect of this is that the interviewers of the DNDS were not dentally educated. This may have diminished the probability that participants gave socially desirable answers. On the other hand, with time to think it over, a written questionnaire could result in better-considered answers to intricate issues. This possibility of higher objectivity of the written questionnaire may have been counteracted by confusion over the meaning of questions, which could not be explained by an interviewer. Since the same line of questioning with the written format was used as with the oral interview of 1986, and since the interviewer in 1986 was

only allowed to explain a question during the interview to a restricted extent, the contribution of such confusion probably is of little importance.

Considering the denture treatment that had been performed between 1986 and 1992, as could be expected, variables indicating the level of satisfaction with complete dentures in 1986 and the functioning of these dentures showed relevance. People being non-satisfied with the 1986-complete dentures, people having the opinion that the 1986-complete dentures may come loose during functioning and that they needed treatment, were more than twice as likely to have complete denture treatment than their counterparts. It has been shown that it is not so much the objective but rather the subjective treatment need that is decisive in the dental setting (19–23). This phenomenon is present in our results in that no objective criteria, as obtained in the 1986-clinical examination, of complete dentures and alveolar ridges were shown to have influence on denture treatment, but only respondents' subjective criteria.

Changes in denture satisfaction were related to the imperfection of the com-



plete dentures as considered by the denture wearers themselves. People in 1986 feeling a need for treatment showed a three times increased likelihood of a shift towards dissatisfaction than the persons not considering it necessary to have complete denture treatment. A shift towards denture dissatisfaction might be expected among those thinking it necessary to have their complete dentures treated, if no actual treatment had been performed to solve the denture problem, or if treatment had not brought the result hoped for. No influence of the variable "Denture treatment" on the changes in denture satisfaction could be observed, while at the same time it was shown (Table 3) that the persons in 1986 who were non-satisfied with their complete dentures were 2.6 times as likely to have them treated between 1986 and 1992. Thus, one may conclude that denture treatment that had been performed did not result in an overall shift towards denture satisfaction. This is in contrast to results of a study by VERVOORN (24). She observed that persons wearing complete dentures showed a significantly higher degree of denture satisfaction after treatment with new complete dentures than before. However, our results can be considered to be in line with those of VAN WAAS (25). He reported a less than expected number of satisfied patients after treatment with new complete dentures and after 1 yr, despite a variety of alterations to the complete dentures that had been performed.

With respect to dental attendance a significant shift towards visits for denture check-ups could be observed. The respondents must have felt the need to have their complete dentures checked. No correlations were found of variables indicating denture dissatisfaction, or denture problems. However, the variable "Denture treatment" was found to have an RR=1.6 for the shift towards denture check-ups. The effect of this variable could well be the result of the performed check-up. This could be supportive of the idea that the motivation behind dental attendance is the respondents' concern about their complete dentures. This concern may also be shown in the correct position of the denture borders, and in the higher frequency of receiving new complete dentures: a higher number of complete dentures that had been made previously, while being edentulous for

the same period of time as the persons who not have shifted towards visits for denture check-ups. This difference in frequency of receiving complete dentures can be illustrated by the difference in average denture age of complete dentures with vs. without treatment. The complete dentures that had been treated since 1986, i.e. were rebased/relined or replaced by new, on average showed a younger denture age than those that had not been treated.

As to dental attendance because of denture problems, the shift towards visits was related to a simultaneous denture treatment. Given the cross-sectional way of measuring one cannot be certain about cause and effect, but following common sense and the very reason for dental treatment, it is likely that the change in dentures was the result of the dental visit, rather than the reverse. No influence of the objective status of the complete dentures, as measured during the DNDS-clinical examination, was found to be of influence on the change in visits. Yet when looking at the respondents' reason for these visits, malfunctioning and wearing were reported. As such, this supports results of others (23, 26, 27): there is disagreement between patient and dentist with respect to evaluation of the quality of complete dentures. Apart from this disagreement between patient and dentist in their way of estimating treatment need, disparity between dental treatment need and demand rises from the finding that patients not necessarily translate a denture problem into an actual dental visit (23, 28, 29). In our results, this was confirmed as about one quarter of the respondents did not consider it necessary to make a dental visit when having denture problems. Adding to this would be the patients' idea that the complaint is beyond treatment, as reported by 21% of the persons with denture problems.

Our results support the idea that patients' opinions regarding the necessity for regular dental check-ups, and for dental treatments, are more decisive than the dentists' for the actual demand for dental care (19-23). It was concluded that patients' concerns have given rise to a change in dental attendance and treatments. The observed increase in the number of dental visits, may thus be a reflection of a favorably changing dental awareness of persons wearing complete

dentures. Indeed, an increasing demand from the edentulous population for dental health care can be expected (3).

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